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TANNINIFEROUS IDIOBLASTS IN THE MESEMBRYANTHEMACEAE

Chester B. Dugdale

(*Department of Biological Sciences, Fairleigh Dickinson University, Rutherford, New Jersey, U.S.A.*)

ABSTRACT

The leaves of most *Mesembryanthemaceae*, when preserved, dehydrated, and cleared, display a pattern of tanniniferous idioblasts. A technique for processing the leaves is presented and questions are raised concerning the adaptive value of these cells and the possible use of their location-patterns as a diagnostic feature in taxonomy.

UITTREKSEL

TANNIENHOUDENDE IDIOBLASTE IN MESEMBRYANTHEMACEAE. Die blare van meeste Mesembryanthemaceae, nadat dit gepreserveer, ontwater en verhelder is, vertoon patrone van tannienhoudende idioblaste. 'n Tegniek om die blare voor te berei word aangebied en die vraag wat die aanpassingswaarde van gebruik van hulle plasingspatroon as 'n diagnostiese kenmerk taksonomie bespreek.

INTRODUCTION

The most arresting feature of a preserved, dehydrated, and cleared leaf of almost all of those desert succulents commonly named "mesembs" is the large number of tanniniferous idioblasts that are visible. My own first encounter with these cells came during my study of the internal structure of *Lithops* and they were noted in the two papers that resulted (Dugdale, 1966, 1968). An extension of that study to the leaves of other mesembs discloses that tanniniferous idioblasts are of very common occurrence in this group of plants. Indeed, it might very well be true that a fuller understanding of these cells could lead to a better understanding of the evolutionary relationships within the group. With the hope, then, of stimulating the interest of students of succulent plants in the study of tanniniferous idioblasts, the following formula and techniques are presented.

MATERIALS AND METHODS

Remove several leaves from a plant and with a razor blade cut some transversally into sections 4–5 mm thick and split others in half longitudinally. If the leaves are sufficiently wide, it is advantageous to split them into thirds rather that into halves. The pieces of leaves are placed into suitably-sized glass jars by species and an identifying label, written in pencil on a piece of index card, is inserted in each jar. This label will be legible when the processing is completed.

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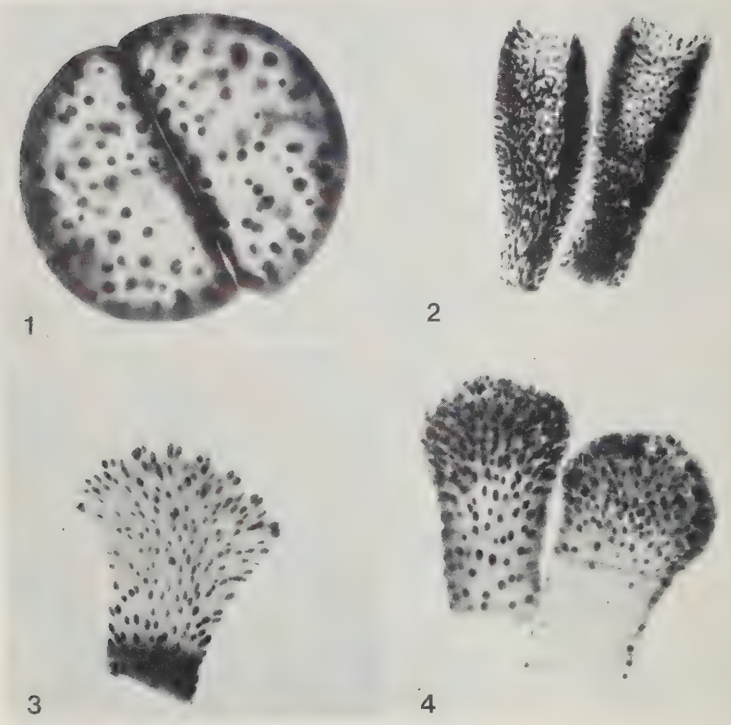

Fig. 1–4.

Fig. 1. *Lithops menellii.* Fig. 2. *Fenestraria aurentiaca*, two halves of same leaf. Fig. 3. *Titanopsis malherbii.* Fig. 4. *Titanopsis calcarea*, front and back of same leaf.

A satisfactory solution for fixing succulent plant tissue follows.

Phosphomolybdic acid	0·8 gm.
Glacial acetic acid	5 ml.
40% Formalin	5 ml.
Water	90 ml.

Pour this solution over the leaf sections in each jar and let them soak for 24 hours. Pour off the fixing solution and replace, at 24 hour intervals, with 80, 95, and two changes of 100% ethyl alcohol. If different batches of material are being processed over a period of time, the used absolute alcohol can be re-used in the lower percentages, since only the 100% alcohol is critical. After dehydration is complete, replace the absolute alcohol with xylol. (If any cloudiness is apparent, immediately replace the xylol with absolute alcohol for another 24 hours.) After 24 hours in xylol the tissue should be completely cleared and the tanniniferous idioblasts will appear as dark mahogany to black-coloured bodies.

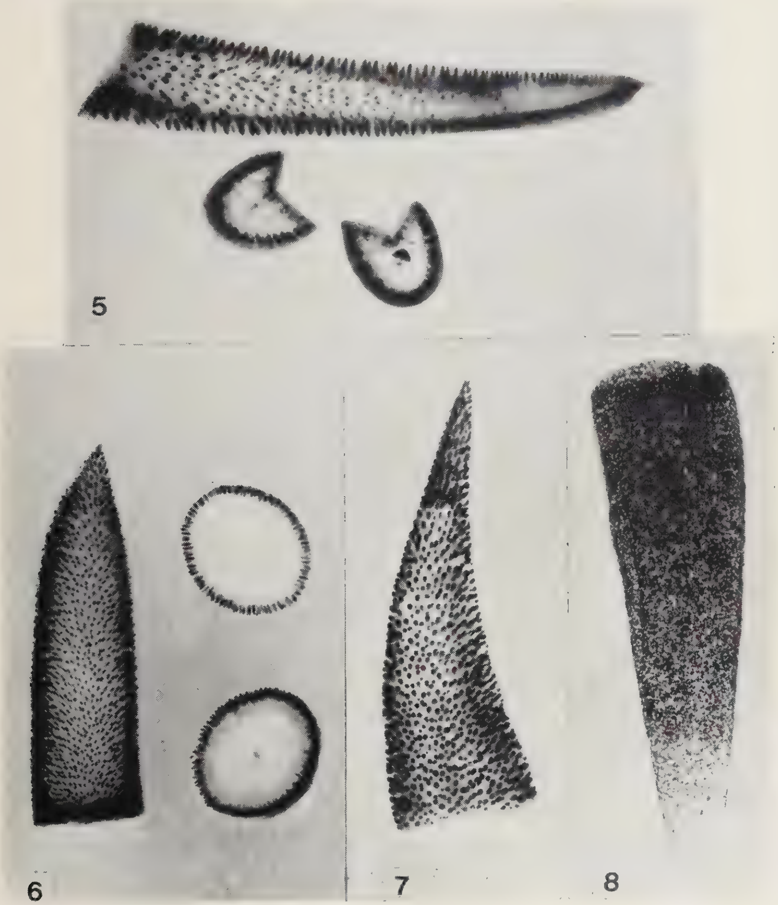

Fig. 5–8.

Fig. 5. *Cheiridopsis candidissima.* Fig. 6. *Cylindrophyllum calamiforme.* Fig. 7. *Bergeranthus vespertinus.* Fig. 8. *Adromischus festivus* (Crassulaceae).

The preserved leaves can be photographed while under xylol in a deep watch glass by transmitted light. Single lens reflex cameras with a macrolens and behind-the-lens metering are particularly appropriate for this work.

DISCUSSION

On the basis of having processed hundreds of plants it can be said that tanniniferous idioblasts occur in varying quantities and patterns in all species of *Lithops*. However, in, for instance, *L. hallii* and *L. salicola* they are restricted to the sepals of the flower and do not appear, except perhaps occasionally, in the main body (leaves) of the plant. In those species of *Lithops* in which these cells are present within the leaves, they appear to occur in fairly distinctive and constant patterns. On occasion I have been able to identify the species of a preserved *Lithops*, in which all other clues are obliterated, solely upon the basis of its idioblast pattern. Even more often one is able to say that a given preserved plant could not be of a certain species because its idioblast pattern is not correct. It is my belief that it will be possible someday to produce a key to the *Lithops* species based upon these patterns used in conjunction with the external diagnostic features.

Outside of the genus *Lithops*, moreover, tanniniferous idioblasts are widely, and perhaps universally, found among the other mesembs. I have recently processed leaves from more than 25 species within 15 genera and idioblasts occurred in almost all of them. Three exceptions were: *Nananthus aloides*, *Gibbaeum petrense*, (but in *G. album* they are present as very fine granules) and *Glottiphyllum parvifolium*. *Delospermum echinatus*, whose affinities have been questioned by others, also had no idioblasts. As in *Lithops*, however, the possibility remains that the idioblasts in these species may occur only in the sepals of the flowers which were not available to me at the time. It is also interesting to note that the leaves of some 5 or 6 *Adromischus* species which were tested were so densely populated with idioblast cells as to be uniquely distinctive.

CONCLUSION

Tanniniferous idioblasts are of interest from two points of view. First of all there is the purely morphological problem of discovering and recording their presence or absence in the various species and of determining whether or not their patterns of dispersal within the leaf are constant and distinctive enough to serve as a taxonomic aid. Secondly, there is the problem of their adaptive value. Several possibilities come to mind: as a source of chemicals used in the healing process, as a deterrent to being eaten by animals, or as a light shield against certain/all wavelengths of light. On a purely speculative basis, I prefer this third possibility, but the answer would need to be experimentally determined.

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